ASTM E2881 - 13 Standard Test Method for Extraction and Derivatization of Vegetable Oils and Fats from Fire Debris and Liquid Samples with Analysis by Gas Chromatography-Mass Spectrometry

Instrument: Shimadzu GC/MS System

Significance and Use

4.1 This test method is useful when oils and fats are suspected as an ignition source or a fuel source in a fire.

4.1.1 The identification of oil and fat residues in samples from a fire scene can support the field investigator's opinion regarding the origin and cause of the fire.

4.1.2 The positive identification of fatty acid(s) does not necessarily mean that the fire was caused by self heating.

4.2 This test method specifically identifies fatty acid derivatives. Oils and fats are comprised primarily of triglycerides (which are fatty acids attached to a glycerol backbone), and some free fatty acids. Free fatty acids and triglycerides are not easily analyzed by the traditional ignitable liquid extraction techniques. Solvent extraction and derivatization to FAME will enable identification by GC-MS.

4.2.1 The identification of an individual fatty acid in fire debris samples does not confirm the presence of oils or fats; however, there are times when large quantities of the oil or fat may be extracted. In such cases a more positive identification can be made.

4.2.2 Oils and fats containing fatty acids with no double bonds will generally have no tendency to self-heat. With increasing unsaturation (1, 2 and 3 double bonds), the tendency to self-heat also increases, such that polyunsaturated fatty acids (PUFAs), such as C18:3, have a high tendency to self-heat.

4.3 This test method is a sensitive separation technique and can detect quantities as small as 3 L of oil or fat residue in an extract from a debris sample.

4.4 This test method shall be performed after all required traditional testing for ignitable liquid residues is completed.

4.5 This test method extracts liquids and residues from porous and nonporous materials of various sizes.

4.6 This test method can be hampered by coincident extraction of interfering compounds present in the fire debris samples.

4.7 This is a destructive technique and whenever possible the entire sample should not be used for the procedure. It is recommended that visual inspection be used to locate portions or areas exhibiting potential oily residue for sub-sampling which would preserve remaining portions for further analyses and also minimize solvent waste. The solvent extracted portions of the sample are not suitable for resampling.

4.8 Alternate methods of extraction, derivatization, or analysis exist and may be suitable for use in obtaining similar results and conclusions.

4.9 Biodiesel, an ignitable liquid, is a trans-esterified product containing FAMEs. The FAME compounds in biodiesel can be detected in fire debris using many fire debris extraction techniques followed directly by GC-MS analysis. Derivatization is not necessary to identify the FAMEs in biodiesel

1. Scope

1.1 This test method covers the extraction, derivatization, and identification of fatty acids indicative of vegetable oils and fats in fire debris and liquid samples. This procedure will also extract animal oils and fats, as these are similar in chemical composition to vegetable oils and fats. Herein, the phrase “oils and fats” will be used to refer to both animal and vegetable derived oils and fats.

1.2 This test method is suitable for successfully extracting oil and fat residues having 8 to 24 carbon atoms.

1.3 The identification of a specific type of oil (for example, olive, corn, linseed) requires a quantitative analysis of the fatty acid esters and is beyond the scope of this test method.

1.4 This test method cannot replace the requisite knowledge, skills, or abilities acquired through appropriate education, training, and experience and should be used in conjunction with sound professional judgment.

1.5 The values stated in SI units are to be regarded as standard. No other units of measurement are included in this standard.

1.6 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

Reference: http://www.astm.org/Standards/E2881.htm